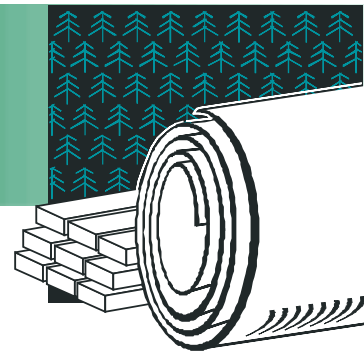


# FOREST PRODUCTS

## Project Fact Sheet



### DESIGN AND DEMONSTRATION OF MULTI-PORT CYLINDER DRYERS

#### BENEFITS

- Increase drying rates and productivity by 20-90%
- Reduce steam consumption by 3-4%
- Decreased CO<sub>2</sub> emissions
- Inexpensive as a retrofit
- Increased machine speed
- Enhanced global competitiveness of the U.S. pulp and paper industry

#### APPLICATIONS

High-performance, compact multi-port condensers are already being used in air conditioner condensers in the auto industry and other fields. In this project, Argonne is applying the technology to develop advanced dryers for the pulp and paper industry. Existing cylinder paper dryers may be retrofitted to include the multiport design for 20% of the cost of a new dryer and little downtime.

### MULTI-PORT DRYER DESIGN COULD CREATE PAPER DRYING BREAKTHROUGHS

Argonne National Laboratory (ANL) has developed a multiport dryer design that could create breakthroughs in drying pulp and paper. The dryer concept involves the flow of steam through multiport passages that are in close proximity to the cylinder dryer surface. This new design achieves significantly higher drying rates than those of conventional dryers by minimizing condensate formation, which reduces heat flow, and by maximizing the heat transfer surface area. Because many U.S. pulp and paper mills have paper machines that are dryer-limited, even a small increase in drying rates can have a big impact on production. Experimental data suggests drying rates can be improved by 20% (relative to spoiler bar technology) to 90% (in cylinder dryers without spoiler bars). Even a 20% increase will translate into billions of dollars in sales for the pulp and paper industry.

Argonne has already proven the feasibility of the concept in laboratory-scale tests conducted during the first phase of the project. During the second phase follow-on project, Argonne and its project partners will fabricate and test a full-scale prototype with the goal of doubling current drying rates. The prototype will also demonstrate the low cost of a multiport dryer retrofit when compared to that of a new dryer.

#### PROTOTYPE MULTI-PORT CYLINDER TO REPLACE CONVENTIONAL DRYERS

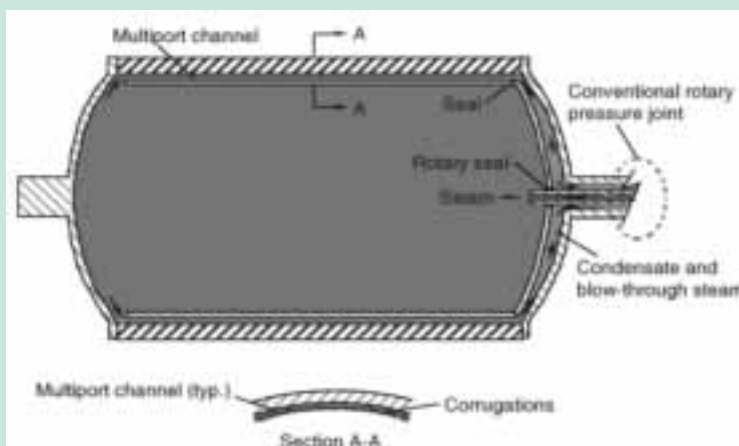


Figure 1. Multiport cylinder-dryer concept



## Project Description

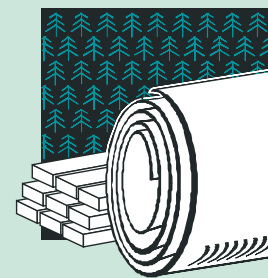
**Goal:** Fabricate and demonstrate a dryer that can increase the current drying rate by 20-90% at reduced manufacturing costs in a full-scale performance test.

In the multiport dryer concept, steam flows through “ports,” or longitudinally oriented passages, close to the cylinder dryer surface. This innovative design minimizes the condensate layer (improving heat transfer) and increases the surface area of the dryer shell.

During the first phase of the project, initiated in November 1997, scientists at ANL demonstrated the proof-of-concept for the design. In this second renewal phase, researchers will develop and validate heat transfer and pressure drop correlations for the design of a prototype. The prototype will then be designed and fabricated, and full-scale testing of the dryer for retrofit applications will be conducted.

## Progress and Milestones

- A basic multiport dryer concept that can be retrofitted in existing cylinder dryers was completed.
- Condensing heat transfer test apparatus and test channel were designed and fabricated at the laboratory scale.
- Proof-of-concept testing in the condensing heat transfer test apparatus was performed.
- The technology was featured in an October 2000 issue of *Design News* magazine and appeared in the February 2001 issue of *TAPPI Journal*, attracting additional industrial partners.
- A prototype multiport dryer assembly will be designed, fabricated, and installed in a research dryer. Two concepts for the design of a prototype are undergoing evaluation.
- Application of the multiport dryer to existing dryers is expected to yield increased drying rates of up to 90%.
- Operating data in the advanced test facility will be documented in a final report and used to facilitate commercialization of the technology.



### PROJECT PARTNERS

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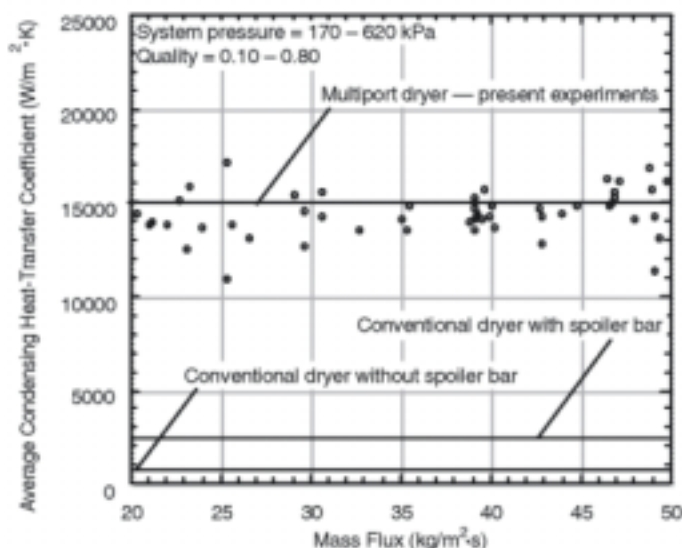


Figure 2. Heat transfer in multiport and conventional cylinder dryers